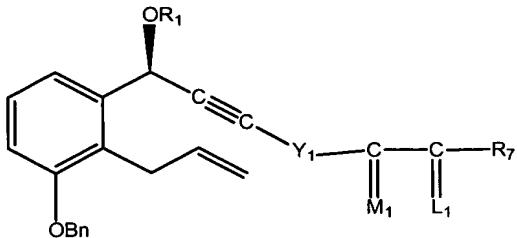
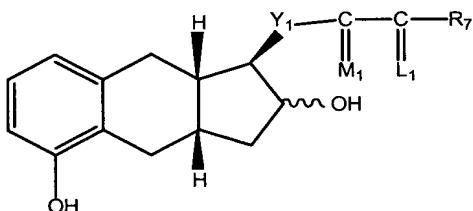


What is claimed is:

1. A process for making 9-deoxy-PGF<sub>1</sub>-type compounds comprising cyclizing a starting compound of the formula:



into a compound of the following formula:



wherein Y<sub>1</sub> is trans-CH=CH-, cis-CH=CH-, -CH<sub>2</sub>(CH<sub>2</sub>)<sub>m</sub>-, or -C≡C-; m is 1,2, or 3;

wherein R<sub>1</sub> is H or an alcohol protecting group;

wherein R<sub>7</sub> is

(1) -C<sub>p</sub>H<sub>2p</sub>-CH<sub>3</sub>, wherein p is an integer from 1 to 5, inclusive,

(2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R<sub>7</sub> is phenoxy or substituted phenoxy, only when R<sub>3</sub> and R<sub>4</sub> are hydrogen or methyl, being the same or different,

(3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl,

(4) cis-CH=CH-CH<sub>2</sub>-CH<sub>3</sub>,

(5) -(CH<sub>2</sub>)<sub>2</sub>-CH(OH)-CH<sub>3</sub>, or

(6) -(CH<sub>2</sub>)<sub>3</sub>-CH=C(CH<sub>3</sub>)<sub>2</sub>;

wherein  $-C(L_1)-R_7$  taken together is

- (1) (C<sub>4</sub>-C<sub>7</sub>)cycloalkyl optionally substituted by 1 to 3 (C<sub>1</sub>-C<sub>5</sub>) alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein M<sub>1</sub> is  $\alpha$ -OH: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OH or  $\alpha$ -OR<sub>1</sub>: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OR<sub>1</sub>, wherein R<sub>5</sub> is hydrogen or methyl and R<sub>1</sub> is an alcohol protecting group; and

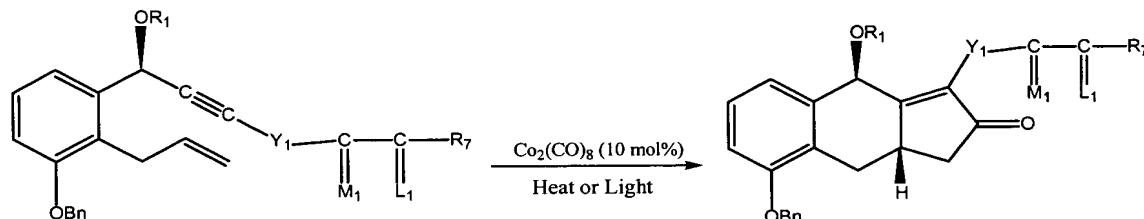
wherein L<sub>1</sub> is  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub>,  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, or a mixture of  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub> and  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, wherein R<sub>3</sub> and R<sub>4</sub> are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R<sub>3</sub> and R<sub>4</sub> is fluoro only when the other is hydrogen or fluoro.

2. The process as claimed in claim 1, wherein the cyclization is a cobalt-mediated cyclization.

3. The process as claimed in claim 2, wherein the starting compound is reacted with Co<sub>2</sub>(CO)<sub>8</sub> in a non-reactive solvent to form a complex.

4. The process as claimed in claim 3, wherein the non-reactive solvent during the complex-forming step is 1,2-DME.

5. A stereoselective process of making a 9-deoxy-PGF<sub>1</sub>-type compound, comprising the following reaction:



wherein R<sub>1</sub> is an alcohol protecting group;

wherein n is 0, 1, 2, or 3;

wherein Y<sub>1</sub> is trans-CH=CH-, cis-CH=CH-, -CH<sub>2</sub>(CH<sub>2</sub>)<sub>m</sub>-, or -C≡C-; m is 1, 2, or 3;

wherein R<sub>7</sub> is

- (1) -C<sub>p</sub>H<sub>2p</sub>-CH<sub>3</sub>, wherein p is an integer from 1 to 5, inclusive,

(2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R<sub>7</sub> is phenoxy or substituted phenoxy, only when R<sub>3</sub> and R<sub>4</sub> are hydrogen or methyl, being the same or different,

(3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl,

(4) cis-CH=CH-CH<sub>2</sub>-CH<sub>3</sub>,

(5) -(CH<sub>2</sub>)<sub>2</sub>-CH(OH)-CH<sub>3</sub>, or

(6) -(CH<sub>2</sub>)<sub>3</sub>-CH=C(CH<sub>3</sub>)<sub>2</sub>;

wherein -C(L<sub>1</sub>)-R<sub>7</sub> taken together is

(1) (C<sub>4</sub>-C<sub>7</sub>)cycloalkyl optionally substituted by 1 to 3 (C<sub>1</sub>-C<sub>3</sub>) alkyl;

(2) 2-(2-furyl)ethyl,

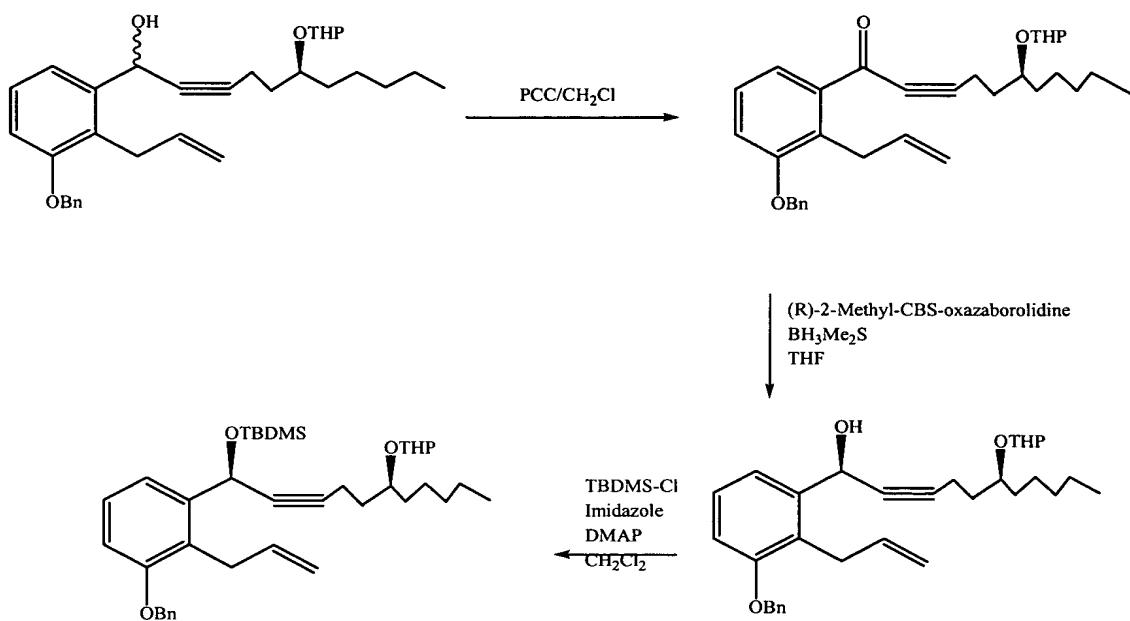
(3) 2-(3-thienyl)ethoxy, or

(4) 3-thienyloxymethyl;

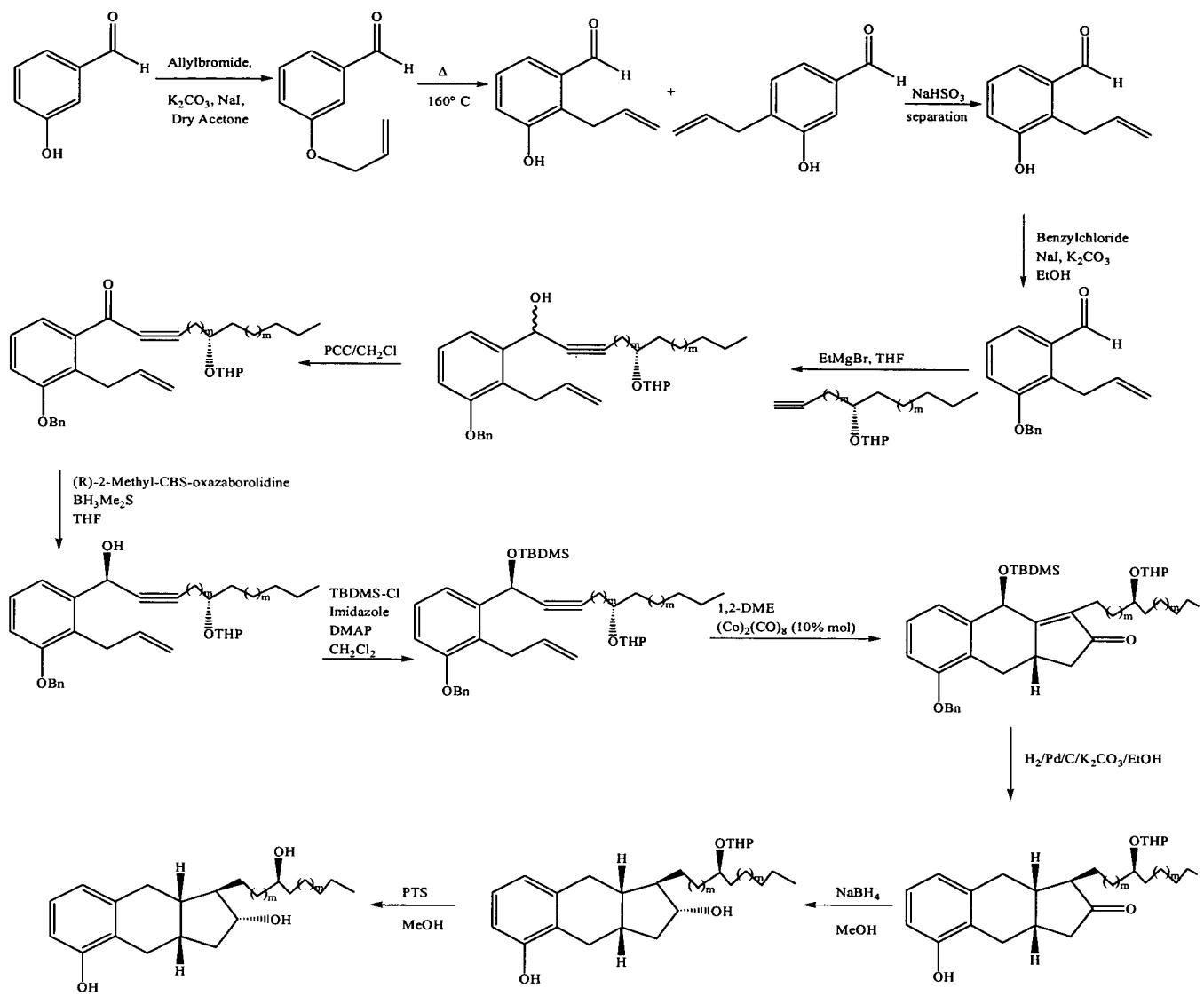
wherein M<sub>1</sub> is α-OH:β-R<sub>5</sub> or α-R<sub>5</sub>:β-OH or α-OR<sub>1</sub>:β-R<sub>5</sub> or α-R<sub>5</sub>: β-OR<sub>1</sub>, wherein R<sub>5</sub> is hydrogen or methyl and R<sub>1</sub> is an alcohol protecting group;

wherein L<sub>1</sub> is α-R<sub>3</sub>:β-R<sub>4</sub>, α-R<sub>4</sub>:β-R<sub>3</sub>, or a mixture of α-R<sub>3</sub>:β-R<sub>4</sub> and α-R<sub>4</sub>:β-R<sub>3</sub>, wherein R<sub>3</sub> and R<sub>4</sub> are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R<sub>3</sub> and R<sub>4</sub> is fluoro only when the other is hydrogen or fluoro.

6. The process as claimed in claim 1, further comprising the following steps:

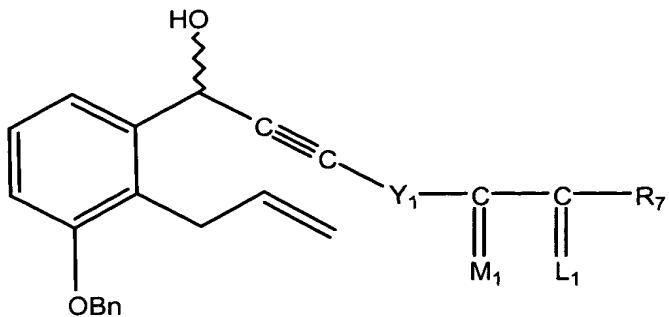


7. The process as claimed in claim 6, comprising the following steps:



8. The process as claimed in claim 7, wherein m is 1.

9. A compound of the formula:



wherein  $Y_1$  is trans-CH=CH-, cis-CH=CH-, -CH<sub>2</sub>(CH<sub>2</sub>)<sub>m</sub>-, or -C≡C-;  $m$  is 1,2, or 3;

wherein  $R_7$  is

- (1) -C<sub>p</sub>H<sub>2p</sub>-CH<sub>3</sub>, wherein  $p$  is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that  $R_7$  is phenoxy or substituted phenoxy, only when  $R_3$  and  $R_4$  are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis-CH=CH-CH<sub>2</sub>-CH<sub>3</sub>,
- (5) -(CH<sub>2</sub>)<sub>2</sub>-CH(OH)-CH<sub>3</sub>, or
- (6) -(CH<sub>2</sub>)<sub>3</sub>-CH=C(CH<sub>3</sub>)<sub>2</sub>;

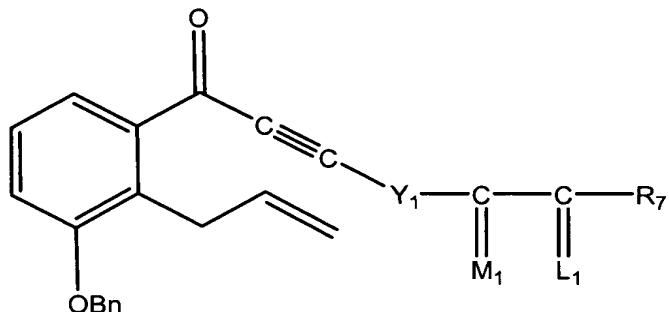
wherein -C(L<sub>1</sub>)-R<sub>7</sub> taken together is

- (1) (C<sub>4</sub>-C<sub>7</sub>)cycloalkyl optionally substituted by 1 to 3 (C<sub>1</sub>-C<sub>5</sub>) alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein  $M_1$  is  $\alpha$ -OH: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OH or  $\alpha$ -OR<sub>1</sub>: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OR<sub>1</sub>, wherein R<sub>5</sub> is hydrogen or methyl and R<sub>1</sub> is an alcohol protecting group;

wherein  $L_1$  is  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub>,  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, or a mixture of  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub> and  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, wherein R<sub>3</sub> and R<sub>4</sub> are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R<sub>3</sub> and R<sub>4</sub> is fluoro only when the other is hydrogen or fluoro.

10. A compound of the formula:



wherein  $Y_1$  is trans- $CH=CH$ -, cis- $CH=CH$ -,  $-CH_2(CH_2)_m$ -, or  $-C\equiv C$ ;-  $m$  is 1,2, or 3;

wherein  $R_7$  is

- (1)  $-C_pH_{2p}-CH_3$ , wherein  $p$  is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl,  $(C_1-C_3)$ alkyl, or  $(C_1-C_3)$ alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that  $R_7$  is phenoxy or substituted phenoxy, only when  $R_3$  and  $R_4$  are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl,  $(C_1-C_3)$ alkyl, or  $(C_1-C_3)$ alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis- $CH=CH-CH_2-CH_3$ ,
- (5)  $-(CH_2)_2-CH(OH)-CH_3$ , or
- (6)  $-(CH_2)_3-CH=C(CH_3)_2$ ;

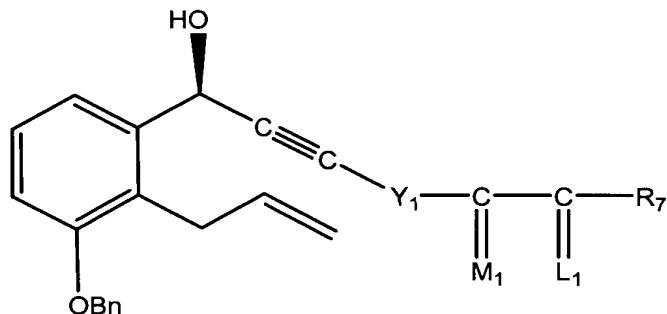
wherein  $-C(L_1)-R_7$  taken together is

- (1)  $(C_4-C_7)$ cycloalkyl optionally substituted by 1 to 3  $(C_1-C_5)$  alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein  $M_1$  is  $\alpha$ -OH: $\beta$ - $R_5$  or  $\alpha$ - $R_5$ : $\beta$ -OH or  $\alpha$ - $OR_1$ : $\beta$ - $R_5$  or  $\alpha$ - $R_5$ : $\beta$ - $OR_1$ , wherein  $R_5$  is hydrogen or methyl and  $R_1$  is an alcohol protecting group;

wherein  $L_1$  is  $\alpha$ - $R_3$ : $\beta$ - $R_4$ ,  $\alpha$ - $R_4$ : $\beta$ - $R_3$ , or a mixture of  $\alpha$ - $R_3$ : $\beta$ - $R_4$  and  $\alpha$ - $R_4$ : $\beta$ - $R_3$ , wherein  $R_3$  and  $R_4$  are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of  $R_3$  and  $R_4$  is fluoro only when the other is hydrogen or fluoro.

## 11. A compound of the formula



wherein  $Y_1$  is trans-CH=CH-, cis-CH=CH-, -CH<sub>2</sub>(CH<sub>2</sub>)<sub>m</sub>-, or -C≡C-;  $m$  is 1,2, or 3;

wherein  $R_7$  is

- (1) -C<sub>p</sub>H<sub>2p</sub>-CH<sub>3</sub>, wherein  $p$  is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that  $R_7$  is phenoxy or substituted phenoxy, only when  $R_3$  and  $R_4$  are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis-CH=CH-CH<sub>2</sub>-CH<sub>3</sub>,
- (5) -(CH<sub>2</sub>)<sub>2</sub>-CH(OH)-CH<sub>3</sub>, or
- (6) -(CH<sub>2</sub>)<sub>3</sub>-CH=C(CH<sub>3</sub>)<sub>2</sub>;

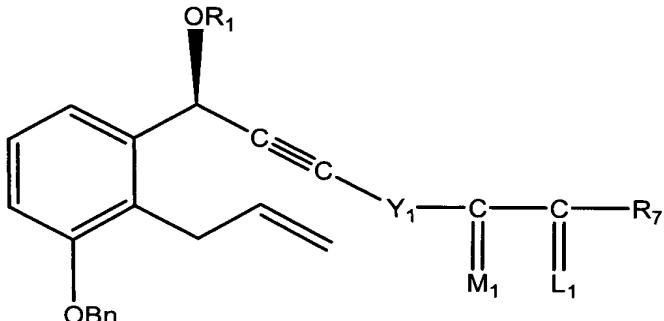
wherein -C(L<sub>1</sub>)-R<sub>7</sub> taken together is

- (1) (C<sub>4</sub>-C<sub>7</sub>)cycloalkyl optionally substituted by 1 to 3 (C<sub>1</sub>-C<sub>5</sub>) alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein  $M_1$  is  $\alpha$ -OH: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OH or  $\alpha$ -OR<sub>1</sub>: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OR<sub>1</sub>, wherein R<sub>5</sub> is hydrogen or methyl and R<sub>1</sub> is an alcohol protecting group;

wherein  $L_1$  is  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub>,  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, or a mixture of  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub> and  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, wherein R<sub>3</sub> and R<sub>4</sub> are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R<sub>3</sub> and R<sub>4</sub> is fluoro only when the other is hydrogen or fluoro.

12. A compound of the formula



wherein R<sub>1</sub> is an alcohol protecting group;

wherein Y<sub>1</sub> is trans-CH=CH-, cis-CH=CH-, -CH<sub>2</sub>(CH<sub>2</sub>)<sub>m</sub>-, or -C≡C-; m is 1,2, or 3;

wherein R<sub>7</sub> is

- (1) -C<sub>p</sub>H<sub>2p</sub>-CH<sub>3</sub>, wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R<sub>7</sub> is phenoxy or substituted phenoxy, only when R<sub>3</sub> and R<sub>4</sub> are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C<sub>1</sub>-C<sub>3</sub>)alkyl, or (C<sub>1</sub>-C<sub>3</sub>)alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis-CH=CH-CH<sub>2</sub>-CH<sub>3</sub>,
- (5) -(CH<sub>2</sub>)<sub>2</sub>-CH(OH)-CH<sub>3</sub>, or
- (6) -(CH<sub>2</sub>)<sub>3</sub>-CH=C(CH<sub>3</sub>)<sub>2</sub>;

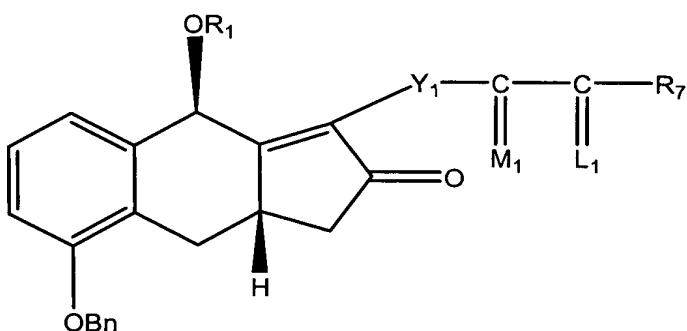
wherein -C(L<sub>1</sub>)-R<sub>7</sub> taken together is

- (1) (C<sub>4</sub>-C<sub>7</sub>)cycloalkyl optionally substituted by 1 to 3 (C<sub>1</sub>-C<sub>5</sub>) alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein  $M_1$  is  $\alpha$ -OH: $\beta$ -Rs or  $\alpha$ -Rs: $\beta$ -OH or  $\alpha$ -OR<sub>1</sub>: $\beta$ -Rs or  $\alpha$ -Rs: $\beta$ -OR<sub>1</sub>, wherein R<sub>s</sub> is hydrogen or methyl and R<sub>1</sub> is an alcohol protecting group;

wherein L<sub>1</sub> is  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub>,  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, or a mixture of  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub> and  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, wherein R<sub>3</sub> and R<sub>4</sub> are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R<sub>3</sub> and R<sub>4</sub> is fluoro only when the other is hydrogen or fluoro.

### 13. A compound of the formula



wherein R<sub>1</sub> is an alcohol protecting group;

wherein  $Y_1$  is trans-CH=CH-, cis-CH=CH-, -CH<sub>2</sub>(CH<sub>2</sub>)<sub>m</sub>-, or -C≡C-; m is 1, 2, or 3;

wherein  $R_7$  is

- (1)  $-C_pH_{2p}-CH_3$ , wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl,  $(C_1-C_3)alkyl$ , or  $(C_1-C_3)alkoxy$ , with the proviso that not more than two substituents are other than alkyl, with the proviso that  $R_7$  is phenoxy or substituted phenoxy, only when  $R_3$  and  $R_4$  are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl,  $(C_1-C_3)alkyl$ , or  $(C_1-C_3)alkoxy$ , with the proviso that not more than two substituents are other than alkyl.

wherein -C(L<sub>1</sub>)-R<sub>7</sub> taken together is

- (1) (C<sub>4</sub>-C<sub>7</sub>)cycloalkyl optionally substituted by 1 to 3 (C<sub>1</sub>-C<sub>5</sub>) alkyl;
- (2) 2-(2-furyl)ethyl,

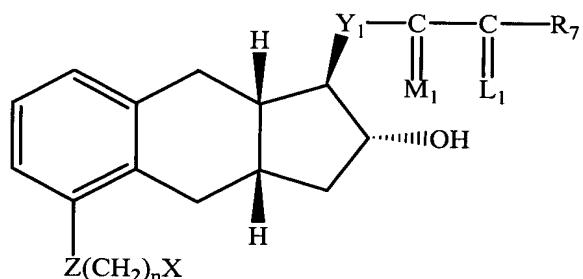
(3) 2-(3-thienyl)ethoxy, or

(4) 3-thienyloxymethyl;

wherein  $M_1$  is  $\alpha$ -OH: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OH or  $\alpha$ -OR<sub>1</sub>: $\beta$ -R<sub>5</sub> or  $\alpha$ -R<sub>5</sub>: $\beta$ -OR<sub>1</sub>, wherein R<sub>5</sub> is hydrogen or methyl and R<sub>1</sub> is an alcohol protecting group;

wherein L<sub>1</sub> is  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub>,  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, or a mixture of  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub> and  $\alpha$ -R<sub>4</sub>: $\beta$ -R<sub>3</sub>, wherein R<sub>3</sub> and R<sub>4</sub> are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R<sub>3</sub> and R<sub>4</sub> is fluoro only when the other is hydrogen or fluoro.

**14. A stereoselectively produced isomeric compound according to the following formula:**



wherein Z, X, Y<sub>1</sub>, M<sub>1</sub>, L<sub>1</sub>, R<sub>7</sub> and n are as defined in claim 1 and said compound is produced according to the stereoselective synthesis of claim 1.

15. The stereoselectively produced isomeric compound of claim 14, wherein Z is O, n is 1, X is COOH, Y<sub>1</sub> is -CH<sub>2</sub>CH<sub>2</sub>- M<sub>1</sub> is  $\alpha$ -OH: $\beta$ -R<sub>5</sub>, wherein R<sub>5</sub> is hydrogen, L<sub>1</sub> is  $\alpha$ -R<sub>3</sub>: $\beta$ -R<sub>4</sub>, wherein R<sub>3</sub> and R<sub>4</sub> are hydrogen and R<sub>7</sub> is propyl.

16. The stereoselectively produced compounds of claim 14, which are produced as pure diasteromers.